J. Indian bot. Soc. 63 : 148—150, 1984

INFLUENCE OF IRON ON THE EXTRACELLULAR PRODUCTION OF AMINO ACIDS BY *FUSARIUM MONILIFORME* SHELD.[1]

S. S. ALI AND M. L. SONAR[2]

Bio-Science Department, Ravishankar University, Raipur

ABSTRACT

Fusarium moniliforme Sheld. (IMI-192976), a soil isolate, was found to produce 947 µg/ml and 202 µg/ml of total amino acid content in the medium of growth with and without iron ($FeCl_3$) in the medium, respectively. In control the main composition of amino acids was alanine, leucine and valine whereas with iron in the medium it was mainly found to consist of aspartic acid and glutamic acid; and alanine was not produced.

INTRODUCTION

Fungi and other heterotrophic micro-organisms have been known to produce various nitrogenous substances in their cultural broths. The presence of amino acids in the cultural broths of bacteria and yeasts has been well established (Kinoshita, 1959). The amino acids produced by the microbial biosynthesis are in their L-forms whereas the chemical synthesis always yields their racemic (DL-) forms (Fowden, 1973). Since, it is only the L-amino acids that are incorporated into the protein molecule, many of these are to be supplemented externally for almost all the heterotrophic organisms including man. The present paper deals with the studies on amino acid production by a soil isolate of *Fusarium moniliforme* Sheld. (IMI-192976) as related to the effects of iron when present in the medium of growth.

MATERIALS AND METHOD

Fusarium moniliforme was grown on Cole's tartarate broth medium with iron as $FeCl_3$ (0.3 mg/l), in still cultures for 10 days. The medium without iron served as control.

The amino acid fraction from the culture filtrate was obtained by treating the culture filtrate with excess volumes of 80% ethanol, filtration, centrifugation, steam drying and refluxing of the supernatant to yield a dried substance (McAnelly, 1959; Hanks and Feldman, 1963). The dried mass was then redissolved in 1 ml of 80% ethanol, 3ml of chloroform was then added and the mixture was thoroughly shaken and centrifuged for 10 minutes at 4000 rpm. The amino acids contained in the aqueous supernatant were then used for qualitative and quantitative analysis of amino acids by paper chromatography (Lederer & Lederer, 1957) and colorimetry (Bode, 1955).

RESULTS

The qualitative analysis of the amino acids revealed the production of alanine, leucine, valine, aspartic acid, glutamic acid, and phenylalanine in control cul-

1. Accepted for publication on March 7, 1983.
2. Department of Botany, Science College, Raipur.

tures. The iron containing medium lacked alanine (Table I).

TABLE I

QALITATIVE PRODUCTION OF AMINO ACIDS *IN VITRO* BY *F. MONILIFORME*

Amino acid	Control	Iron ($FeCl_3$) containing medium.
Alanine	+	—
Leucine	+	+
Valine	+	+
Aspartic acid	+	+
Glutamic acid	+	+
Phenylalanine	+	+

(+) represents presence.
(—) represents absence.

Quantitative determination of each of the amino acid fraction showed that alanine, leucine and valine, together formed the bulk of the total quantity of amino acids produced by *F. moniliforme* in the control medium (Table II). In the medium containing iron ($FeCl_3$) the quantities of aspartic acid and glutamic acid produced were higher, and the quantities of the other amino acids were lower than in the control medium.

TABLE II

IN VITRO PRODUCTION OF AMINO ACIDS BY *F. MONILIFORME*

Amino acid	Quantity (μg/ml)	
	Control	Iron containing medium
Alanine	100	00
Leucine	24	7
Valine	32	19
Aspartic acid	16	497
Glutamic acid	12	418
Phenylalanine	18	6
Total	202	947

In the medium containing iron ($FeCl_3$), total amount of amino acids was, however, about five times to that in the control medium.

DISCUSSION

Production of amino acids in the culture medium, containing sugar and inorganic salt solution, by *F. moniliforme* or other microorganisms provided evidence for these being an excreted product of the fungal metabolism (Bilai and Zakordonets, 1971). They represent a product of biosynthesis removed out of the cells either to reduce the level of cellular nitrogen or to create a reserve of nitrogenous nutrients outside the cell. And the biosynthetic pathways for alkyl and acidic group of amino acids are different (Fowden, 1973).

The observations that presence of iron in the culture medium resulted in bringing a shift in the qualitative production of amino acids by *F. moniliforme* suggested an inhibitory role of iron upon the phosphatases operative in the alkyl amino acid biosynthesis here. Apparently, the significant influence of iron, in this case, appeared in an increased production of the total amino acids out of which the bulk was constituted by aspartic acid and glutamic acid.

REFERENCE

BILAI, V. I. AND L. A. ZAKORDONETS 1971. Dynamics of amino acid content in *Fusarium moniliforme* 51070 V. *Proste sirostu*, in the process of growth. *Mikrobiol. ZH* (KYYIV) **33** : 306-309.

BODE, F. 1955. A simple and better method for the quantitative estimation of amino acids and peptides by Cu. complex *Biochem. Z.* **326** :

433-435.

FOWDEN, L. 1973. "Amino Acids". In : *Phytochemistry*. Vol. 2. Van Nostraud, New York.

HANKS, R. W. AND A. W. FELDMAN 1973. Composition of free amino acids and amides in roots of healthy and *Radopholus similis* infected grape fruit seedlings. *Phytopath.* **53** : 419-422.

KINOSHITA, S. 1959. The production of amino acids by Fermentation process. *Adv. App. Microbiol.* **1** : 201-214.

LEDERER, E., AND M. LEDERER 1957. *Chromatography : A review of Principles and Application*. Elservier Pub. Co. Amsterdam.

MCANELLY, C. W. 1959. Free amino acids in the cultural media and cells of *Fusarium solani* f. *phaseoli*. *Phytopath.* **49** : 734-737.